NHDOT SPR2 PROGRAM
RESEARCH PROGRESS REPORT

INSTRUCTIONS:
Project Managers and/or research project investigators should complete a progress report at least every three months during the project duration. Reports are due the 5th of the month following the end of the quarter. Please provide a project update even if no work was done during this reporting period.

Project # 26962P	**Report Period** Year: 2017 ☒Q1 (Jan-Mar) ☐Q2 (Apr-Jun) ☐Q3 (Jul-Sep) ☐Q4 (Oct-Dec)	
Project Title: Reducing Cracking in New Bridge Curbs		
Project Investigator: Eshan Dave **Phone: 603-862-5268**	**E-mail: eshan.dave@unh.edu**	
Research Start Date: December 1, 2016	**Research End Date:** September 30, 2019	**Project schedule status:** ☒ On schedule ☐ Ahead of schedule ☐ Behind schedule

Brief Project Description: In recent years a number of newly constructed concrete curbs NHDOT bridges have suffered from premature early age cracking. This project focusses on proposing necessary changes to the materials specifications as well as construction and maintenance practices to lower propensity for early age cracking. The scope of the project involves developing of a crack measurement system to quantify cracking in curbs, using the measurement system on a number of newly constructed curbs with different concrete mixes (varying cementitious material amounts, water amounts etc.), construction practices, and curing strategies. Analysis of results from field trials and development of recommendations will also be completed.

Progress this Quarter (include meetings, installations, equipment purchases, significant progress, etc.):
Over this quarter, the team of Civil Engineering undergraduates who are conducting the work as a senior project has nearly completed the crack measurement system. This work is under the supervision of Beth Klemann and Andy Hall from NHDOT as well as Eshan Dave from UNH who is also the PI of this project. Preliminarily testing of the system was conducted at a NHDOT bridge site in February and some design changes to the guide system followed, including a system that allows the guide wheels to be further adjusted to various distances. Weekly meetings are held to discuss progress as well as optimizing the design of the crack measurement system. Initial progress on camera systems for the crack measurement system has been focused primarily on determining proper camera distance, viewing angle, and required lighting.

In February, the principal investigator and undergraduate research assistant, along with members of NHDOT, met in Concord for a kick-off meeting to discuss the scope of the project as well as disseminate information gathered from a preliminary literature review of similar studies conducted by others. The discussion that followed the kick-off presentation included potential ways of performing test curbs without having to get significant authorization from NHDOT and that could be implemented relatively easily. A list of bridge sites experiencing curb cracking was also requested to allow researchers to investigate existing bridge sites. The NHDOT Bridge Maintenance Engineers have agreed to provide such list. The discussions at the kick-off meeting also identified a bridge curb in Hampton that was currently undergoing reconstruction.

On February 15th a trip to the Hampton site was made by members of NHDOT, the senior project team (crack measurement system team), principal investigator and undergraduate researcher. The site visit included a brief tour of a curb that was being deconstructed and prepared for a replacement. During the visit the undergraduate team tested the cart of the crack measurement system on the recently replaced curb. Undergraduate researcher gathered photographs and information on curb cracking that had already taken place since it was poured.

In Mid-March the undergraduate research assistant visited 2 bridge sites in Coos County (bridge sites were located in Jefferson and Pittsburg) and collected data in a similar fashion to that of the Hampton site. In late March the Hampton bridge curb that had been deconstructed in February was poured. Undergraduate research assistant visited the curb site immediately before and after the pour to document formwork, rebar, and curing setup. Five days following the pour researcher returned to the site to document the status of the curb which had already displayed signs of cracking.

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In addition to site visits, undergraduate researcher continued with the literature review as well as beginning the preparation of the Task 1 Report.

Items needed from NHDOT (i.e., Concurrence, Sub-contract, Assignments, Samples, Testing, etc…):
In order to further improve upon narrowing the potential causes for early curb cracking more existing bridge sites experiencing cracking should be investigated. A list of other bridges affected by early curb cracking should be developed by NHDOT and provided to UNH researchers in order to develop a larger inventory to compare cracking between bridge sites. Any available data on the QC and QA testing of concrete from bridge curbs as well as mix batching information will be needed from NHDOT to complete review of current practices.

Anticipated research next 3 months:
Following key topics will be undertaken by the research team during next 3 months:

(1) Conduct further curb investigations on various NHDOT bridges.
(2) Follow-up visits to the Hampton bridge curb around the 14^{th} and 28^{th} day after being poured.
(3) Completion of Task 1 Report. This will include a review of current NHDOT practices for curb construction as well as a summary of reviewed literature. Recommendations for test trials will also be made.
(4) Task 1 completion meeting. Meeting between researchers and the technical advisory group (TAG) will be scheduled to discuss project schedule, progress, and next tasks.
(5) Work with NHDOT to identify curb locations or field trials.

Circumstances affecting project: Describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope, and budget, along with recommended solutions to those problems.
No challenges effecting the progress of the project have yet occurred.

Tasks (from Work Plan)	Planned % Complete	Actual % Complete
1. Review of Current Practices	**58**	**65**
2. Construction of Concrete Curbs	**0**	**0**
3. Survey of Concrete Curbs for Cracking Performance	**0**	**0**
4. Analysis of Results and Recommendation Development	**0**	**0**